REMARKS

Claims 23-34, 37-54, 56, and 58-65 are pending in the present application. Claims 1-22, 35, 36, 55, and 57 were previously canceled. Claims 23, 56, and 58-61 have been amended. Applicants respectfully request reconsideration of the claims in view of the following remarks.

As an initial matter, Applicants respectfully assert that the explanation contained in the Advisory Action is incomplete. It appears that the Advisory Action only addressed the issue that Meagley and Hirayama may not be combined by examining only Meagley, and completely ignored the other issues raised by Applicants.

For example, how do the cited references teach or disclose the photoresist layer being *completely* diffused? How is it justified to combine Meagley and Hirayama in light of the teaching away contained in Hirayama? (As discussed above, Hirayama teaches away from the combination. The Advisory Action ignored the teachings of Hirayama and focused on Meagley.) How is it proper to combine Hirayam, Meagley, and Lee?

Applicants respectfully request that these issues and those raised below be addressed by the Examiner such that Applicants may adequately respond.

CLAIMS 23-34

Claims 23-30, 33, and 34 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over U.S. Patent Publication No. 2006/0141400 (hereinafter "Hirayama") in view of U.S. Patent Publication No. 2005/0084794 (hereinafter "Meagley"). Claims 31 and 32 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayama in view of Meagley and U.S. Patent Publication No. 2005/0037269 (hereinafter "Levinson"). Applicants respectfully traverse these rejections.

Not all Elements Taught or Suggested

Regarding claim 23, the Office Action acknowledged that Hirayama fails to disclose the step "directing optical energy through the immersion fluid and onto the photoresist layer after the photoresist layer has been completely diffused with the immersion fluid." The Office Action asserted that, while Hirayama fails to disclose this element, Meagley discloses this step and that it would have been obvious to one of ordinary skill in the art to have allowed the photoresist layer and the immersion fluid to diffuse together for "improved performance of the photoresist during the patterning process." (Office Action, page 4.) Applicants respectfully disagree with this assertion.

In particular, in the present case there is absolutely no teaching, suggestion, or motivation to teach or suggest that "the photoresist layer has been *completely diffused* with the immersion fluid" as explicitly recited in Applicants' claim 23. Rather, Meagley (the reference relied upon by the Office Action as teaching this feature) only discloses improving the wetting between the photoresist layer and the immersion fluid.

For example, Meagley asserts, "In various alternative embodiments of the invention, a photoresist is provided having one or more constituent components that encourage wetting between the photoresist layer and the IML in such manner as to impart beneficial liquid-contact properties to the photoresist layer. For such an embodiment in which the IML is water, a photoresist is provided having one or more hydrophilic constituents." (Meagley, paragraph [0016].) Meagley continues, "The photoresist of photoresist layer 402 has additives incorporated therein that provide improved liquid-contact properties. For example, the photoresist has additives that are soluble in the IML 403. As shown by the arrows 410 in FIG. 4, diffusion of particular photoresist constituents (e.g., surfactant) into the IML 403 is promoted, thus providing

improved performance of the photoresist in accordance with various embodiments of the invention." (Meagley, paragraph [0037].) It should be noted that paragraph [0037] of Meagley is the section referenced by the Office Action. (Office Action, pages 3-4.) Notably, nowhere in these sections does Meagley teach or suggest waiting for the photoresist layer to be *completely diffused* with the immersion fluid *before* exposing. The surface contact to which Meagley is concerned does not require complete diffusion.

On the other hand, the embodiment of Applicants' invention recited in claim 23 ensures that a more uniform thickness of photoresist is achieved among the various dies on a wafer by allowing the photoresist layer become completely diffused with the immersion fluid and reaching a final thickness. In particular, paragraphs [0036] – [0040] discusses a problem that may occur with the patterning of a layer being inconsistent over a wafer due to a different thickness of photoresist material when the photoresist material is not allowed to completely diffuse with the immersion fluid prior to exposure.

It is clear from the above remarks that Meagley includes no teaching, suggestion, or motivation to allow the photoresist layer to become *completely diffused* with the immersion fluid *before* directing optical energy. Rather, Meagley merely teaches or suggests method of improving the surface contact between the photoresist layer and the immersion fluid. The surface contact is completely independent of whether the photoresist layer is *completely* diffused with the immersion fluid. Accordingly, Applicants respectfully request that the rejection of claim 23 be withdrawn.

Improper to Combine

Furthermore, Applicants respectfully assert that it is improper to combine Hirayama with Meagley as suggested by the Office Action. "A prior art reference must be considered in its

entirety, i.e., as a whole, *including portions that would lead away from the claimed invention*." (MPEP § 2141.02.) (Underlining in original, italics added.) In this case, Hirayama relates to forming a resist protecting film such that both the resist film and the liquid used is prevented from changing properties during the liquid immersion lithography. (Hirayama, Abstract.) That is, Hirayama explicitly teaches away from the disclosure of Meagley as well as the embodiment of Applicants' invention as recited in claim 23. In this situation, it is clearly improper to combine Hirayama and Meagley as suggested by the Office Action. "[I]mpermissible hindsight *must be avoided* and the legal conclusion must be reached on the basis of the facts gleaned from the prior art." (MPEP § 2142, emphasis added.)

Accordingly, Applicants respectfully request that the rejection of claim 23 be withdrawn. Claims 24-34 depend from and further limits claim 23 in a patentable sense, and accordingly, Applicants respectfully request that the rejections thereof be withdrawn as well.

CLAIMS 56 and 58-65

Claims 60-65 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayama in view of Meagley. Claim 60 has been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayama in view of Meagley and U.S. Patent Publication No. 2005/0123863 (hereinafter "Chang"). Claims 56, 58, and 59 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayama in view of Meagley and U.S. Patent Publication No. 2005/0266683 (hereinafter "Lee"). Applicants respectfully traverse these rejections.

Regarding independent claim 61 (from which claims 56, 58-60, and 62-65 depend), Applicants have amended claim 61 to recite that "converting only an upper portion of the photoresist layer into a treated layer" and "the converting being a separate process from the

immersing." By this amendment, Applicants clearly recite that a portion of the photoresist layer is converted into a treated layer and that the converting is a separate process from the immersing. In other words, a protective layer is not simply placed on the photoresist layer in this embodiment. That is, the converting is not simply the diffusion of the immersion fluid into the photoresist layer.

The cited references fail to teach or disclose these limitations, and accordingly, Applicants respectfully request that the rejections to claim 61 be withdrawn. Claims 56, 58-60, and 62-65 depend from and further limit claim 61 in a patentable sense, and accordingly, Applicants respectfully request that the rejections thereof be withdrawn as well.

Applicants would also like to note that the combination of Hirayama, Meagley, and Lee asserted by the Office Action regarding claims 56, 58, and 59 is improper. "If the proposed modification would render the prior art invention being modified *unsatisfactory for its intended purpose*, then there is *no suggestion or motivation* to make the proposed modification." (MPEP § 2143.01, emphasis added.) In this case, Lee assertedly discloses modifying a polymer photoresist for *removal* of the polymer photoresist. This is explicitly stated in the following sections of Lee:

> [0033] Another embodiment of the invention provides a composition and a process ***for removing polymers, such as photoresists***, gap-fill/sacrificial polymers, and organic antireflective coatings, for example. Preferably, the polymers have a functional group, such as a carboxyl[.] More preferably, the polymers are transparent at a wavelength less than about 250 nm.
>
> [0034] The polymer may, in some embodiments, be used as an antireflective coating or anti-reflectants for front-end and back-end lithography, including conformal products to cover topography and planarizing products to fill trenches and vias in Dual Damascence technology, such as a barrier anti-reflective coating (BARC) or an organic bottom anti-reflective coating, or gap-fill coating material. Commercial products are available from companies such as Rohm & Haas Electronic Material, Brewer Science, Inc., and Honeywell Electronic Materials etc. Further, ***in some embodiments, the polymer—sometimes a photoresist—may***

> ***be modified prior to stripping/removal***. Exemplary modifications can include, but are not limited to, chemical amplification, cross linking, chemical etching, deep ultraviolet (DUV) treatment, ion implantation, plasma treatment, gamma- or x-ray irradiation, electron beam treatment, laser ablation, or the like, or a combination thereof.
> (Lee, paragraphs [0033] and [0034], emphasis added.)

Clearly, the section cited by the Office Action is teaching modifying the photoresist to remove the photoresist. Removing the photoresist as assertedly taught by Lee would render the photoresist in the process of Hirayama and Meagley inoperative. Because "the proposed modification would render the prior art invention being modified *unsatisfactory for its intended purpose*, then there is *no suggestion or motivation* to make the proposed modification." (MPEP § 2143.01, emphasis added.) Accordingly, the combination of Hirayama, Meagley, and Lee is improper, and Applicants respectfully request that the rejections of claims 56, 58, and 59 be withdrawn.

CLAIMS 37-54

Claims 37-43, 46-50, and 53 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayaman in view of Meagley and Chang. Claims 44 and 45 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayaman, Meagley, Chang, and further in view of Levinson. Claims 51, 52, and 54 have been rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Hirayaman, Meagley, Chang, and further in view of U.S. Patent No. 7,176,522 (hereinafter "Cheng"). Applicants respectfully traverse these rejections.

Not all Elements Taught or Suggested

Regarding claim 37, Applicants' claim 37 recites at least one distinguishing feature of an embodiment of Applicants' invention, namely, "the immersion fluid contacting the photoresist

layer and being *diffused substantially throughout* the photoresist layer." The Office Action asserted that Hirayama and Meagley discloses this feature as discussed with reference to claim 23. However, Hirayama and Meagley fails to teach or suggest "the immersion fluid . . . being diffused substantially throughout the photoresist layer" as recited in Applicants' claim 37.

In particular, in the present case, there is absolutely no teaching, suggestion, or motivation to teach or suggest "the immersion fluid . . . being *diffused substantially throughout* the photoresist layer" as explicitly recited in Applicants' claim 37. Rather, Meagley (the reference relied upon by the Office Action as teaching this feature) only discloses improving the wetting between the photoresist layer and the immersion fluid.

For example, Meagley asserts, "In various alternative embodiments of the invention, a photoresist is provided having one or more constituent components that encourage wetting between the photoresist layer and the IML in such manner as to impart beneficial liquid-contact properties to the photoresist layer. For such an embodiment in which the IML is water, a photoresist is provided having one or more hydrophilic constituents." (Meagley, paragraph [0016].) Meagley continues, "The photoresist of photoresist layer 402 has additives incorporated therein that provide improved liquid-contact properties. For example, the photoresist has additives that are soluble in the IML 403. As shown by the arrows 410 in FIG. 4, diffusion of particular photoresist constituents (e.g., surfactant) into the IML 403 is promoted, thus providing improved performance of the photoresist in accordance with various embodiments of the invention." (Meagley, paragraph [0037].) It should be noted that paragraph [0037] of Meagley is the section referenced by the Office Action. (Office Action, pages 3-4.) Notably, nowhere in these sections does Meagley teach or suggest the immersion fluid being *diffused substantially*

throughout the photoresist layer. The surface contact to which Meagley is concerned does not require substantial diffusion.

On the other hand, the embodiment of Applicants' invention recited in claim 37 ensures that a more uniform thickness of photoresist is achieved among the various dies on a wafer by allowing the photoresist layer to become completely diffused with the immersion fluid and reaching a final thickness. In particular, paragraphs [0036] – [0040] discusses a problem that may occur with the patterning of a layer being inconsistent over a wafer due to a different thickness of photoresist material when the photoresist material is not allowed to completely diffuse with the immersion fluid prior to exposure.

It is clear from the above remarks that Meagley includes no teaching or suggestion for "the immersion fluid . . . being *diffused substantially throughout* the photoresist layer". Rather, Meagley merely teaches or suggests method of improving the surface contact between the photoresist and the immersion fluid. The surface contact is completely independent of whether the immersion fluid being diffused substantially throughout the photoresist layer. Accordingly, Applicants respectfully request that the rejection of claim 37 be withdrawn.

Improper to Combine

Furthermore, Applicants respectfully assert that it is improper to combine Hirayama with Meagley as suggested by the Office Action. "A prior art reference must be considered in its entirety, i.e., as a whole, *including portions that would lead away from the claimed invention*." (MPEP § 2141.02.) (Underlining in original, italics added.) In this case, Hirayama relates to forming a resist protecting film such that both the resist film and the liquid used is prevented form changing properties during the liquid immersion lithography. (Hirayama, Abstract.) That is, Hirayama explicitly teaches away from the disclosure of Meagley as well as the embodiment

of Applicants' invention as recited in claim 23. In this situation, it is clearly improper to combine Hirayama and Meagley as suggested by the Office Action. "[I]mpermissible hindsight *must be avoided* and the legal conclusion must be reached on the basis of the facts gleaned from the prior art." (MPEP § 2142, emphasis added.)

Accordingly, Applicants respectfully request that the rejection of claim 37 be withdrawn. Claims 38-54 depend from and further limits claim 37 in a patentable sense, and accordingly, Applicants respectfully request that the rejections thereof be withdrawn as well.

In view of the above, Applicants respectfully submit that this response complies with 37 C.F.R. § 1.114. Applicants further submit that the claims are in condition for allowance. No new matter has been added by this amendment. If the Examiner should have any questions, please contact Applicants' attorney at the number listed below. In the event that the enclosed fees are insufficient, please charge any additional fees required to keep this application pending, or credit any overpayment, to Deposit Account No. 50-1065.

Respectfully submitted,

January 2, 2008
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